Perceived Environments Impact on Exercise Using Virtual Reality

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Quarantine Edition

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Background

- Using Virtual Reality (VR) during exercise has been shown to have a positive impact
  - Overall performance
  - Endurance
  - Motivation
  - Some evidence of decreases in RPE[1]
- Previous research has focused on VR effects during aerobic exercise
  - Some research on resistance exercise VR in clinical therapy setting
  - Limited research on VR effects on performance during resistance training for healthy individuals

Original Plan

- “What effects do motivational and environmental cues have on an individual’s performance?”
- Cycle ergometer
  - watts and distance
- 5-10 minute trials
  - Baseline
  - VR Headset
    - Relaxing and action/fast bike scenes in 360-degree motion
  - Audio cues
    - positive or negative encouragement
- Perceived motivation (1-10 scale), RPE (6-20 scale)

Research Question

Does the environment perceived by the individual have an effect on the number of bicep curls completed?

Subject Information:

	Age (years)	Weight (lbs)	Curling Weight (lbs)
Male (n=4)	20.5	191.25	15
Female (n=6)	22	138.67	10

Methods

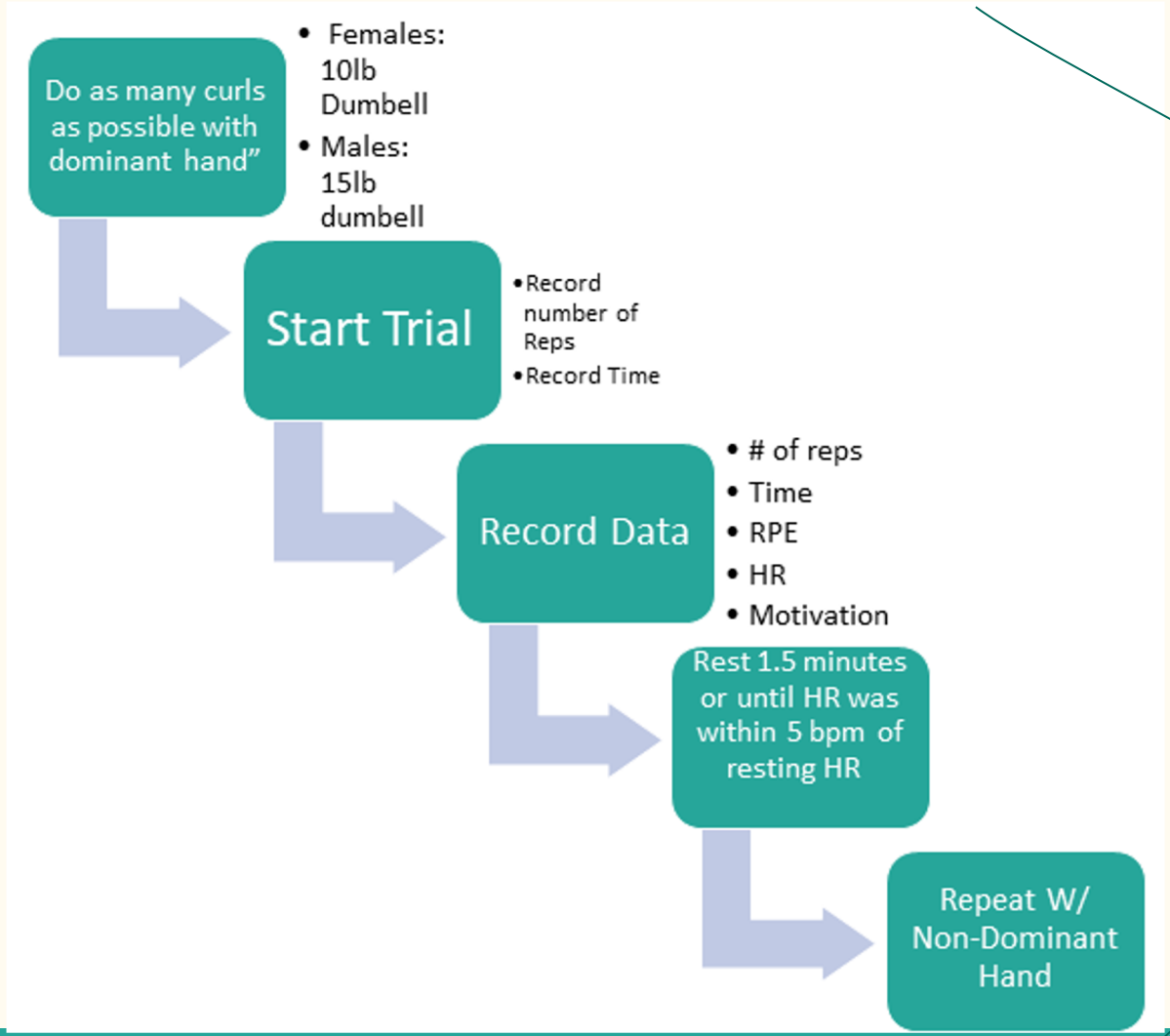
Baseline Trial:

- Resting heart rate (HR) was taken
- Subject was instructed to perform as many bicep curls as possible
  - Trial was timed, number of reps were recorded
  - Started with dominant hand
  - Weight: 10lbs Females, 15lbs Males
- Immediately after trial HR was recorded
- Motivation level on a scale of 1-10 and RPE were recorded
- Subject rested for at least 1.5 minutes or until HR was within 5 bpm of the original RHR
- Repeat with non-dominant hand with the same components recorded

Rate of Perceived Exertion (RPE) Scale

BORG RPE	MODIFIED RPE	BREATHING	TRAINING ZONE	% of MHR*	EXERCISE TYPE
6	0	No Exertion	1	50%-60%	Warm up
7		Very Light			
8	1				
9					
10	2	Deeper but comfortable breathing. Able to hold a conversation.	2	60%-70%	Recovery
11					
12	3				
13		Aware that breathing is harder; able to talk but difficult to hold conversation	3	70%-80%	Aerobic
14	4				
15	5	Starting to breathe hard and getting uncomfortable	4	80%-90%	Anaerobic
16	6				
17	7	Deep and forceful breathing. Uncomfortable and not wanting to talk	5	90-100%	VO^2 Max
18	8				
19	9	Extremely hard			
20	10	Maximum exertion			

METHODS



Repeat at 48 hours under new condition

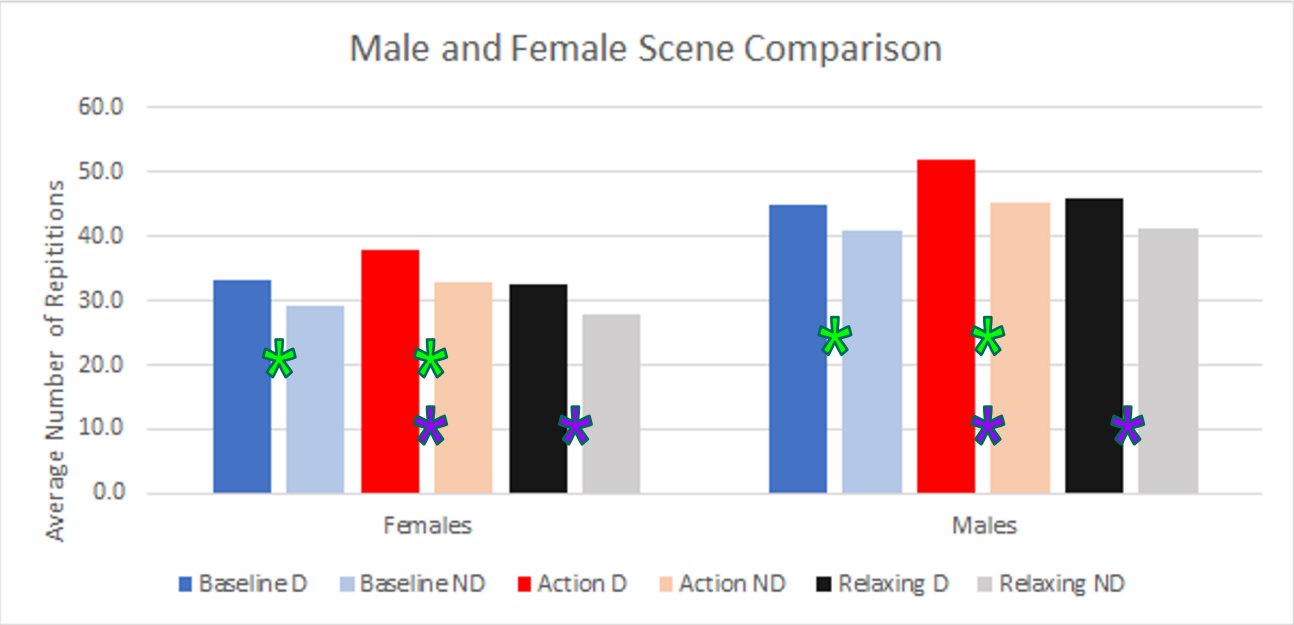
Methods cont.

- 3 environmental conditions:
    - None: baseline
    - Action: Marvel's Captain America: Civil War
    - Relaxing: National Geographic's Lions
- Qualitative Data Collection
    - Do you prefer to listen to music while working out?
    - Do you watch anything while working out?

Relaxing VR Scene: National Geographic's Lions

Action VR Scene: Marvel's Captain America: Civil War

Data - Repetitions ND and D arm

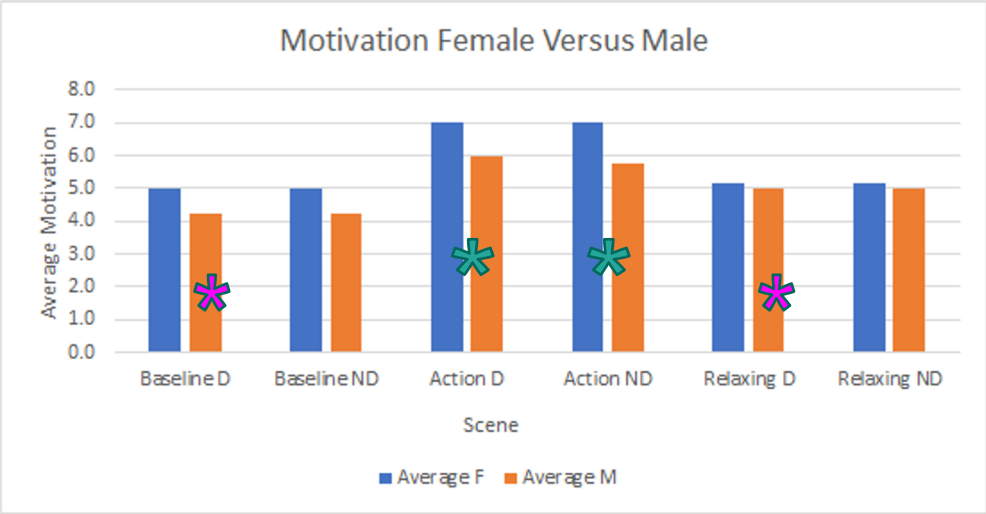


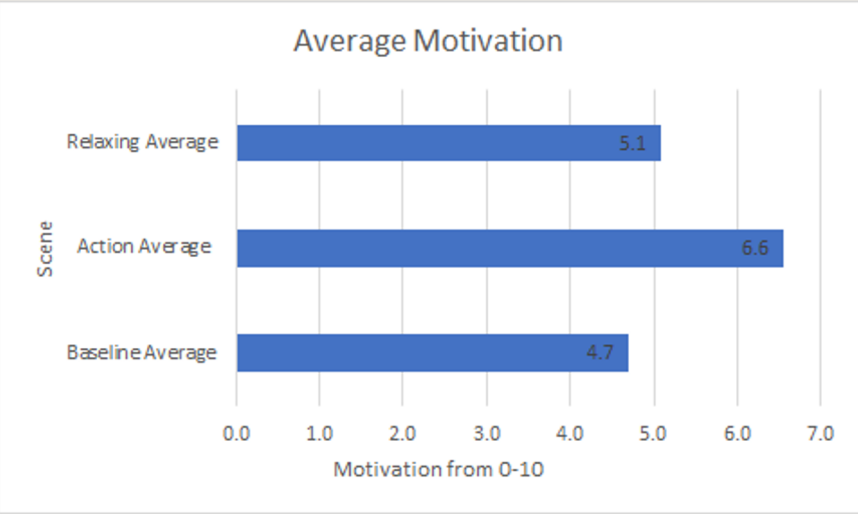
* - comparing baseline v action

* - comparing action v relaxing

Percent Change	Average F	Average M
Baseline vs Action D	14.6	15.6
Baseline vs Action ND	11.9	11.0
Baseline vs Relaxing D	-2.0	2.2
Baseline vs Relaxing ND	-5.1	1.2

Data - Motivation

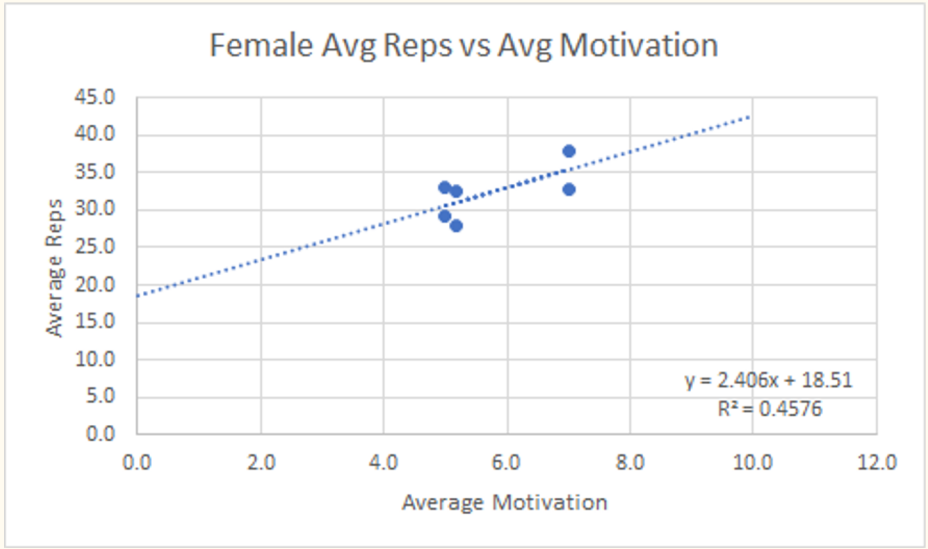


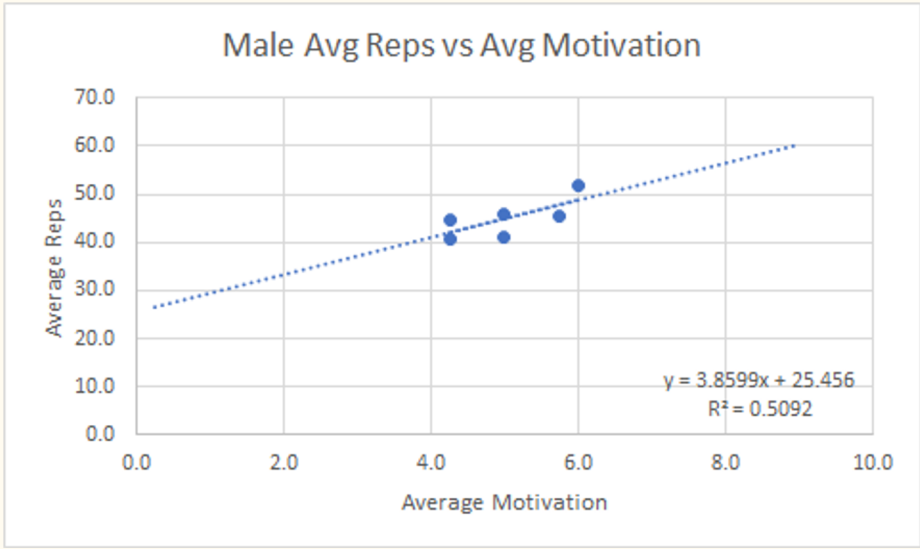


* Males versus females action = $p < 0.05$

* Males relaxing versus baseline = $p < 0.05$

Data - Motivation vs. Reps





Results

- The action scene resulted in more repetitions completed than baseline and relaxing scenes when comparing same arm
- Significant increase in motivation between men and women when action scene is perceived, regardless of arm used
- Significant difference for all subjects in baseline vs. action (↑)and action vs. relaxing (↑)
    - No significance for baseline vs. relaxing (=)
- Significant difference for males only in baseline vs. action (↑), baseline vs. relaxing (↑), action vs. relaxing (↓)
- Significant difference for females only in baseline vs. action (↑) and action vs. relaxing (↓)
    - No significance for baseline vs. relaxing (=)

Group Discussion

- Subjects asked if they preferred to listen to music while working out
  - Everyone answered yes
- Subjects asked if anyone had watched something, either on television or their phones.
  - Most subjects said they watch whatever is on the TV at the gym

- Subject 1: “I watch a show on Netflix while I bike, but not something I have to pay really close attention to.”
- Subject 8: “I only listen to music while I lift but I watch sports on the TVs while I run.”

Conclusion

- Action creates a difference
- Relaxation didn’t create a difference
- Use of VR may be dependent on the specific scenes involved
- Limitations...
  - Limited exercise opportunities because of goggles
  - Small population size - could’ve made some things that weren’t significantly different. For example dominant arm non significance.
- Future
  - See the role of personality
  - Using different weights for different body weights

References

[1] Chen, C.-H., Jeng, M.-C., Fung, C.-P., Doong, J.-L., & Chuang, T.-Y. (2009). Psychological Benefits of Virtual Reality for Patients in Rehabilitation Therapy. *Journal of Sport Rehabilitation*, *18*(2), 258–268. doi: 10.1123/jsr.18.2.258

[2] Sarıkabak, M., Yaman, Ç., Tok, S., & Binboga, E. (2017). The Effects of Positive and Negative Feedback on Maximal Voluntary Contraction Level of the Biceps Brachii Muscle: Moderating Roles of Gender and Conscientiousness. Perceptual and Motor Skills, 124(1), 118–130. https://doi.org/10.1177/0031512516673752

https://www.youtube.com/watch?v=zcbeZ9QxBjA

https://www.youtube.com/watch?v=sPyAQQklc1s